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Report on the in-depth review of the national communication of the Netherlands

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Under Articles 4 and 12 of the Convention, Parties are required to prepare national communications on their implementation of the Convention. Guidelines for the preparation of national communications and the process for their review were agreed on by the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change, by its decisions 9/2 and 10/1, and by the Conference of the Parties, at its first session, by its decisions 2/CP.1 and 3/CP.1 (see FCCC/CP/1995/7/Add.1). In accordance with these decisions, a compilation and synthesis of the first 33 national communications from Annex I Parties was prepared (FCCC/CP/1996/12 and Add.1 and Add.2).

When reviewing the implementation of the Convention by Parties, the subsidiary bodies and the Conference of the Parties will have this report available to them in English as well as the summary of the report in the six official languages of the United Nations. (These bodies will also have before them the executive summary of the first national communication of the Netherlands and country-specific information drawn from a compilation and synthesis report covering all countries that have submitted national communications.)

Summary[1]

1. The in-depth review of the Netherlands' national communication, which in accordance with the country's ratification of the Convention covers the Kingdom in Europe, was carried out between November 1995 and March 1996 and included a country visit by the team from 20 to 24 November 1995. The team included experts from India, the Russian Federation, Canada and the International Energy Agency.

2. The Netherlands is a major natural gas producer. It uses approximately half of its production domestically, which also represents around 50 per cent of total energy supply. Oil represents a little more than a third, coal 10-15 per cent, and nuclear and renewables (mostly waste utilization) together 2 per cent. In 1990, imported electricity made up 1.2 per cent of the energy balance. Carbon dioxide (CO_2) emissions represented 78 per cent of emissions in 1990 on a global warming potential (GWP) basis. The energy use per capita was slightly lower than the average for countries of the Organisation for Economic Co-operation and Development (OECD), as were the CO_2 emissions per capita (approximately 11 compared to 12 tons in 1990). The Netherlands is a distribution and refining centre for north-western Europe as evidenced by the importance of the transport sector, and a processing centre for petrochemicals and metals which gives an energy-intensive industry structure. The emissions from bunker fuels are equivalent to 25 per cent of the total CO_2 emissions, which is the highest percentage reported by Parties that have submitted communications. Compared to most other European countries, the Netherlands has relatively low prices are for gas and electricity, while the gasoline prices are somewhat higher compared to most neighbouring countries. Recently, the supply of electricity, especially from combined heat and power (CHP) plants, has grown faster than demand and has created excess capacity.

3. The team concluded that the Netherlands in general had made considerable efforts to provide and present information in accordance with the guidelines. The team noted that climate change appears to have high political priority; the national strategy covers all aspects of climate change, actively involving relevant ministries and agencies. The Netherlands also has methodological strengths in fields such as inventories and projections, as well as in monitoring policies such as the voluntary agreements. As envisaged in the communication, the new Government has reoriented a number of policies and approaches and also implemented new ones.

4. The Netherlands started to develop and implement its climate strategy in the late 1980s and had to devise its own policy framework in terms of targets, reference years and inventories methodology, without being able to draw upon an established international

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[1] In accordance with decision 2/CP.1 of the Conference of the Parties, the full draft of this report was communicated to the Government of the Netherlands, which had no further comments.

practice. The original approach for CO_2 proved to be slightly different from the reporting guidelines adopted subsequently by the Intergovernmental Panel on Climate Change (IPCC) for the national communications regarding base year and treatment of feedstocks. Further, emissions figures were adjusted for 1990 which was warmer than normal, which gives a difference of 3.8 per cent for CO_2. The differences are carefully explained in the communication. Still the team felt that the difference in approaches complicated an assessment of progress towards meeting the aim of the Convention. In 1995, the Netherlands adopted the IPCC methodology except for the temperature corrections.

5. In 1995 also, the Government revised its CO_2 emissions target, which is now to achieve a 3 per cent reduction from 1990 levels in 2000. This target relates to the temperature-corrected 1990 figure and is on a "net" basis adding emissions by sources and removals by sinks; and the Netherlands has adopted 1990 as base year and IPCC methodology to calculate emissions for feedstocks. The team notes that this target is almost equivalent, assuming 2000 is a 'normal average' year in temperature conditions, to a stabilization at 1990 non-temperature-corrected figures and that, given the effects of change in base year, and the present projections for feedstocks and sequestration, it equals an emission level 2-3 per cent higher than the target reported in the national communication. The Netherlands has also set itself targets of reducing methane (CH_4) emissions by 10 per cent and stabilizing nitrous oxide (N_2O) emissions at 1990 levels by 2000.

6. The policies outlined in the communication include a policy mix of standards and regulations, financial and fiscal incentives, long-term agreements between government and industry, education, and research and development, all of which are described as “no regrets” measures. The team noted the strong emphasis on the interaction between different measures affecting sectors such as transport, industry, energy transformation and residential. The team noted in particular the experience gained with voluntary agreements on energy conservation with industry since 1989, which had brought about a 9 per cent improvement in energy efficiency in major energy sectors between 1989 and 1994, and the environmental programmes implemented by the energy distribution sector. Further, the existing environmental tax and the regulatory energy/CO_2 tax introduced on 1 January 1996 appear from the estimated effects to be effective instruments, but the team noted that exemptions are based on competitiveness as well as on the use of alternative sectoral instruments, such as voluntary agreements for the exempted sectors. With regard to methane emissions, changes in waste practices including a total ban on landfills are expected to yield major reductions into the next century. Waste gas utilization for energy purposes will also offset CO_2 emissions. The effectiveness of the Netherlands' climate change policy is seen as depending considerably on the progress in the European Community, in particular regarding the proposed energy/CO_2 tax.

7. Provisional data for CO_2 emissions show a growth of 5.3 per cent in actual emissions and 2.3 per cent in temperature-adjusted emissions over the period 1990-1994. For transport alone it was 15 per cent. The team notes that in order to reach its national target for CO_2, the Netherlands will have to reverse this growth. It then appears crucial that the voluntary

agreements in the energy distribution and industry sectors yield their ambitious targets. Methane emissions decreased slightly from 1990 to 1994. Landfill practices are being drastically changed, however, and could result in overall reductions exceeding the 10 per cent target. Additional initiatives in the offshore sector are expected to further improve the situation. Nitrous oxide (N_2O) emissions grew by 13 per cent from 1990 to 1994 and future trends largely depend on the effects of the European Union (EU) common agricultural policy. In view of the aforementioned past growth in CO_2 emissions, uncertainties related to effects of certain measures, and inherent uncertainties in projection estimates, returning greenhouse gas emissions to their 1990 levels remain an open question. However, it is noted that regular monitoring is a crucial element of Netherlands' policymaking.

8. The team noted that the Netherlands is giving high priority to climate change related research. It has made an assessment of possible impacts and adaptation measures, and it has adopted flexible coastal zone management practices that could ensure an autonomous adaptation to gradual changes in sealevel and weather patterns. The Netherlands has also conducted extensive information and public awareness campaigns.

9. The Netherlands made contributions of US$ 52.8 million to the pilot phase of the Global Environment Facility (GEF), and its contribution to the first replenishment of the GEF amounted to US$ 71.4 million. The ratio of official development assistance (ODA) to gross national product (GNP) has been over 0.7 per cent for a number of years. The country's know-how of coastal zone and river delta management is transferred through bilateral projects. The Netherlands Government has earmarked f. 84 million up to 1999 to develop the concept of activities implemented jointly (AIJ) through contributions to practical pilot projects both in Annex I and non-Annex I countries.

I. INTRODUCTION AND NATIONAL CIRCUMSTANCES

10. The Netherlands ratified the Convention for the Kingdom in Europe on 20 December 1993. The secretariat received the Netherlands' first national communication on 20 September 1994. The Netherlands also submitted a memorandum on innovative and potentially replicable measures on 1 November 1994, which is to be seen as an integral part of the communication. The in-depth review of the communication was carried out during the period November 1995 to March 1996, including a country visit from 20 to 24 November 1995. The review team consisted of Mr. H. N. Srivastava (India), Mr. Vladimir Berdin (Russian Federation), Mr. Art Jaques (Canada), Ms. Jane Ellis (International Energy Agency) and Mr. Peer Stiansen (UNFCCC secretariat, Coordinator).

11. The area of the Netherlands in Europe is small, low-lying and very densely populated, with 27 per cent of the land destined for urban, infrastructural and other uses. Fifty-nine per cent is intensively farmed. The port of Rotterdam is a distribution centre for north-western Europe, and Schiphol airport provides transit services for Europe. Consequently, transport is an important sector in the economy. The population density (441 persons/km2)

combined with a well developed infrastructure provides favourable conditions for public transport. The Netherlands has experienced relatively little fluctuation in the economy in the 1990s with modest, but increasing, growth in the gross domestic product (GDP). It has a relatively high population growth (currently 0.7 per cent) compared to other European countries, but this is still not higher than the average for OECD countries.

12. The Netherlands is a major natural gas producer and it uses approximately half of its production domestically. Thanks to this resource and its strategic location, it has major energy-intensive industries, including refineries and petrochemical production based on oil imported through Rotterdam, as well as metals. Around 50 per cent of the country's energy needs are supplied by natural gas, while oil represents a little more than a third, coal 10 to 15 per cent, and nuclear and renewables (mostly waste utilization) together 2 per cent. It has also imported some electricity on a regular basis; 1.2 per cent of the energy balance and 13 per cent of the electricity consumption in 1990 (source: IEA statistics). The energy use per capita is slightly lower than the OECD average, as are CO_2 emissions per capita (approximately 11 compared to 12 tons in 1990). Still, these are high in a European context due to the low supply of non-fossil fuels. Compared to most other European countries, the Netherlands has relatively low prices for gas and electricity, while the gasoline prices are somewhat higher compared to most neighbouring countries. Recently, the supply of electricity, especially from CHP stations, has grown faster than demand, creating excess capacity which is expected to prevail for some years.

13. In policy development, the Netherlands has a strong tradition of building a consensus between the various stakeholders, including non-governmental organizations. This tradition makes it possible to implement measures in, for example, industry on a voluntary basis without necessarily applying a legal framework and is made possible by the moderate size of the country and number of stakeholders. However, this cooperative approach works alongside strong legal and economic measures.

14. The Netherlands has, in principle, a four-year cycle for formulating comprehensive environmental policies through the national environmental policy plans (NEPPs), involving ministries which have the responsibility of taking climate-change considerations into account in their operations, as well as implementing specific policies. The team noted that climate change appears to have a relatively high political priority in the Netherlands, which started to develop a specific climate change strategy and implementing mitigation measures during the second half of the 1980s, well before international negotiations on this issue had begun. The first NEPP in 1989 initiated policies and measures to meet environmental targets and was updated in 1991 (NEPP Plus), and NEPP 2 was issued in 1993. A white paper on climate change was made public in 1991. Policy is laid down through, for example, memoranda on energy conservation and other papers on energy, transport and waste policies. The team acknowledged the wide involvement of relevant ministries as well as agencies such as the meteorological office, the energy and environment agency (NOVEM) and Senter, in carrying out the various parts of the strategy.

15. Having started early, the Netherlands had to devise its own policy framework in terms of targets, reference years and inventories methodology, without being able to draw upon an established international practice. The approach for CO_2 proved to be slightly different from that adopted subsequently in the IPCC reporting guidelines for national communications. The Netherlands used average figures for 1989 and 1990 as a reference year and counted all emissions from feedstocks as released in the year of production. Further, emissions inventories were adjusted for emissions related to heating, to allow for temperatures higher or lower than normal. The reference time period, as well as 1990, was warmer than normal, leading to an upwards adjustment. This adjustment, it is argued, makes it easier to distinguish trends from short-term fluctuations, which is important for monitoring and developing policies. These differences are carefully explained in the communication, although they nevertheless complicate the assessment of progress towards meeting the commitments under Article 4.2(a) and (b) of the Convention.

16. The national communication was produced in September 1994, with much of the work, assumptions and analysis having been done before the election of a new Government in May 1994. This Government has since introduced some changes in policy directions that could naturally not be reported in the communication, for example, budget cuts that were outlined in a letter to parliament dated 11 October 1994. Then in June 1995, it submitted a letter (the so-called "repair" letter) outlining measures to compensate for the effects of the budget reduction, and sent another letter on climate change policy to parliament in September 1995 containing revised emission projections, some additional policies and measures, and adjustments in the national policy approach which make it more compatible with the format in which it is reported under the Convention. Also, a long-term strategy looking beyond 2000 was in preparation at the time of the team's visit and has been sent to the parliament recently (The Netherlands' Second Memorandum on Climate Change, June 1996).

17. The Netherlands has adopted targets for the limitation of greenhouse gas (GHG) emissions following a gas-by-gas approach rather than adding all gases using GWPs. Such targets could be adopted later when GWPs are more reliable. For CO_2, the national communication refers to a reduction target of 3 to 5 per cent by 2000 within the original policy approach. In accordance with a revision envisaged in the communication, where it was also stated that the implementation would depend on international developments, the new Government has decided that the provisional 5 per cent target should not come into force, and it also revised the policy approach. It is now aiming at a 3 per cent reduction compared to temperature-adjusted 1990 figures. This is almost equivalent to a stabilization target in non-adjusted figures. The revised approach uses 1990 as base year and the IPCC methodology with no special treatment of feedstocks. Moreover, net sequestration in the land use change and forestry sector could contribute to meeting this target. Following the Intergovernmental Panel on Climate Change (IPCC) methodology around U4 Mt CO_2 to the base year figure, equivalent to 2 to 3 per cent of the emissions. Thus these technical changes makes the new 3 per cent target slightly less ambitious than inside the old policy approach. The Netherlands

has also set a 10 per cent reduction target for methane and a stabilization target for nitrous oxide, as well as a stabilization target for CO_2 emissions from transport by the year 2000 at the 1986 level. There are also targets for ozone precursors in the order of 50 to 60 per cent reductions over the decade.

18. The Netherlands is a member of the European Union, which provides an additional arena for developing commitments and policies and measures. Currently this is seen as having a limited effect on measures being implemented domestically, as implementation of policies and measures union wide has progressed slowly, in the Union as a whole.

19. The Netherlands energy sector is being liberalized, and developments, particularly in the electricity sector, could be important for future emission levels. The *Third White Paper on Energy Policy*, published in December 1995, proposes greater freedom in the generation, supply and import of electricity to non-captive customers. Third party access to electricity networks and the separation of generation, transmission and distribution has also been proposed. In addition, the four central generators will be merged. The second pillar of this White Paper is 'sustainable energy economy', where targets are a one-third improvement of energy efficiency between 1995 and 2020 and a rise in the share of renewables from 1 to 10 per cent in 2020.

20. As in many other countries, the economic situation is putting downward pressure on public expenditure. This has resulted in a general decision to economize budgets for central administration in the coming years, which could affect continuity of programmes and also the general direction that policy developments may take. Still, the Third *White Paper on Energy Policy* has contributed to restoring the budget from the cuts mentioned in paragraph 16, mainly by fiscal measures.

II. INVENTORIES OF ANTHROPOGENIC EMISSIONS AND REMOVALS

21. The national communication covers all major greenhouse gases and precursors with the exception of sulphur hexafluoride (SF_6), which is currently being investigated. The team was provided with methodological documents and emission estimates for the years 1980, 1985, and 1990 to 1994. Temperature-corrected values, based on the "heating degree days" indicator, were also included for CO_2 emissions. This was done in a transparent way with an explanation annexed to the communication. The review team notes that for internal policy purposes the temperature correction methodology has merit, but it does create some confusion when presented in the same tables as the actual values. Based on the 1994 IPCC GWPs, and the unadjusted figures, CO_2 accounted for 78 per cent, CH_4 for 12 per cent, N_2O for 8 percent and perfluorocarbons (PFCs) for 2 per cent of the 1990 emissions.

22. In general, the Netherlands used the IPCC methodology for CO_2, CH_4 and N_2O wherever possible. The national communication contains the minimum IPCC data tables and summary explanations of the methodologies. PFC emissions were estimated using default

IPCC emission factors. The detailed basis for the estimates of nitrogen oxides (NO_x), non-methane volatile organic compounds (NMVOCs) and carbon monoxide (CO) was described to the team, as it was lacking in the communication.

23. For combustion-related **carbon dioxide emissions**, the estimates are based on the simple top-down IPCC methodology using aggregate emission factors and supply-side energy data compiled by the Netherlands Central Bureau of Statistics and published in *Energy Supply in the Netherlands, Annual Figures*. Agreement on appropriate emission factors was sought and obtained between the Central Bureau of Statistics, the emission registration branch of the Netherlands technical university (TNO), the National Institute of Public Health and Environmental Protection (RIVM), the Ministry of Housing, Spatial Planning and Environment, the Directorate-General for Energy (Ministry of Economic Affairs) and the Energy Research Foundation (ECN). Carbon dioxide emissions have not been revised from the figures in the communication and are estimated at 167.6 million tonnes for 1990 using the IPCC approach. Major sources of emissions based on the IPCC sector definitions are: energy transformation, 30 per cent; industry, 29 per cent; transport, 16 per cent; residential, 13 per cent; and non-residential, agriculture and other sectors, 13 per cent. The overall uncertainty for these CO_2 estimates, although only estimated for fuel combustion activities, is estimated to be no more than 2 per cent and is a result of uncertainty in the energy statistics and the emission factors used in the aggregate approach.

24. The Netherlands reported inventories according to the IPCC methodology as well as to its national policy approach and carefully described the major differences. For feedstocks, the Netherlands has traditionally used a methodology based on detailed estimates of the fraction of carbon emitted during the lifetime of each product. These fractions are then counted as released immediately, which in the present situation represents an overestimation of the actual emissions during the year. From 1995 the Netherlands will follow the IPCC format also for domestic purposes. The inventories also included some industrial processes not yet described in the IPCC methodology guidelines. Estimates of emissions have also been made for industrial processes involving the production and use of lime and the incineration of fossil fuel derived products. Some differences have been noted by the Netherlands between the IPCC defaults and the Netherlands emission factors in the detailed fuel approach. The Netherlands informed the review team that these differences are still being evaluated. For CO_2, the growth from 1990 to 1994 (preliminary figure) in the unadjusted figures was 5.3 per cent, but only 2.3 per cent in the temperature-corrected figures.

25. The Netherlands' communication contains an estimate of 120 Gg for net CO_2 sequestration within the IPCC category **land-use change and forestry**. The estimate is based on the sink created by the extra area and changed tree species planted in the Netherlands. A new estimate is based on the total increment in the volume of the biomass minus fellings, and this figure for 1990 is 1,500 Gg.

26. Emissions from **international marine and aviation bunker fuels** are included as separate items and, following IPCC reporting guidelines, do not appear in the total estimates

of emissions for all gases. Only CO_2 emissions are reported. In comparison to most other countries, the emissions are high, equivalent to almost 25 per cent of the total CO_2 emissions. The fuel data used to estimate these emissions are based on fuel delivered to vessels and, as noted in the background document, some of the emissions may occur within the Netherlands. Provisional data show more than 10 per cent growth between 1990 and 1994.

27. The revised figure for anthropogenic **methane emissions** was approximately 1,060 Gg in 1990, compared with 1,067 Gg in the communication, with agriculture accounting for 47 per cent, landfills for 36 per cent, and gas production, transmission and distribution 12 per cent, with the remaining 5 per cent coming from oil production, fuel combustion, and sewage treatment. Emissions from biomass combustion were not estimated, nor were any estimates provided at the sector level described under the IPCC reporting category for fuel combustion. Emission factors specific to conditions in the Netherlands have been calculated for estimating emissions from livestock and manure. For landfills, a first order decay model modified to incorporate data specific to the Netherlands has been used. The team notes that while the emission estimates for wastes are deemed to have an uncertainty of 50 per cent and those for other sectors 30 per cent, the overall uncertainty assigned to CH_4 emissions is 30 per cent. The team acknowledges that the Netherlands is conducting measurement programmes to verify the assumptions in its landfill model. Over the period 1985-1993, methane emissions remained relatively constant, but showed a slight decrease in 1994.

28. Emissions of **nitrous oxide** have been re-estimated at 51.5 Gg in 1990, compared to 59.5 Gg in the communication, reflecting improved emission factors based on measurements, in particular for polluted inland and coastal waters. Soils are the major source, accounting for an estimated 43 per cent, industrial processes next accounting for 35 per cent, fuel combustion 12 per cent, polluted surface waters 7 per cent and waste treatment 1 per cent. A number of sources have been included in the Netherlands' inventory for which the IPCC does not currently have a default methodology. Of note is an estimate for polluted surface waters and an estimate of anthropogenic background emissions from soils, which together account for 50 per cent of the N_2O emission total. An additional source identified by the Netherlands is caprolactam production. Owing to confidentiality agreements, no background data on this source could be provided to the review team. Notwithstanding the uncertainties associated with these sources, the team acknowledges the efforts made in the Netherlands to identify and quantify all emission sources. The overall uncertainty in the inventory has been estimated at 50 to 100 per cent. Nitrous oxide emissions grew by 13 per cent from 1990 to 1994.

29. Emissions of **PFCs** are estimated in the communication as 0.516 Gg of tetrafluoromethane (CF_4) and 0.0516 Gg of hexafluoroethane (C_2F_6), constituting 2 per cent of total greenhouse gas emissions in 1990. These estimates are based on average default emission factors derived from measurements made outside the Netherlands. In June 1996, estimates of fluorocarbons emissions in 1990 of about 8, 500 Gg CO_2 equivalent were released. Emissions of hydrofluorocarbons (**HFCs**) were estimated to be zero in 1990, as their introduction to replace ozone-depleting substances started later.

III. POLICIES AND MEASURES

30. The Netherlands' climate policy in principle covers emissions and removals of all major greenhouse gases. The national communication outlines a number of policies and measures currently in place or planned to reduce emissions of CO_2, CH_4, and ozone precursors. The policies outlined in the communication include a “mixed bag” of standards and regulations, financial and fiscal incentives, long-term agreements (LTAs) between government and industry, education, and research and development. These are all described as “no regrets” measures. The team noted the strong emphasis on the interaction between different measures affecting the same sectors, in particular the use of policies and measures such as taxes, voluntary agreements, subsidy schemes and information programmes all targeting CO_2 emissions from main sectors.

31. The Netherlands, in a letter of 1 November 1994 responding to a request from the Intergovernmental Negotiating Committee, highlighted three measures that it regards as innovative and potentially replicable in other countries. These are energy conservation in industry and voluntary agreements (LTA), the contribution of the energy distribution sector, and environmental levies on energy commodities. The team also noted certain innovative policies and measures conceived and introduced since publication of the communication, such as a scheme whereby residential users voluntarily pay more for “green” electricity, and the setting up of “green” investment funds which offer tax benefits.

32. The new Government has introduced several changes in policy compared with that reported in the national communication, as was in fact envisaged in the same document. To reduce public spending, some existing programmes, especially direct subsidy schemes for wind and solar energy and energy efficiency installations, were eliminated or curtailed in the 1995 budget. Cuts also affected a demonstration project on CO_2 capture and disposal described in the communication. However, in a "repair" letter of June 1995, some new measures were introduced to offset the effects of the cuts. To further respond to growing projections, another letter announcing additional measures expected to yield reductions of 2.1 million tonnes of CO_2 was sent to parliament in September 1995, and a regulatory energy/carbon tax was applied as from 1 January 1996.

33. Road transport is the only subsector for which a CO_2 target is set. The target is stabilization at 1989/90 levels by 1995 and an 11 per cent reduction by 2000, equivalent to stabilization at the 1986 level. Other sectors or subsectors have GHG-related targets although these are expressed in different terms. For example, in the framework of voluntary agreements a majority of industrial subsectors have energy-efficiency improvement targets; non-residential buildings have a target of a 23 per cent energy efficiency improvement between 1989 and 2000, agriculture a 26 per cent improvement over the same time period and the electricity production sector aims by 2000 to have increased the average efficiency of generation from 40 per cent to 43 per cent, installed a total CHP capacity of 8,000 MW and to have renewables account for 3 per cent of total energy consumption.

34. As a **cross-cutting** measure, an **environmental tax** has been in force since 1988, the level of which is based 50/50 on the carbon and energy content of fuels. The energy portion of this tax has been raised from f. 0.3352/GJ (as stated in the communication) to f. 0.3906/GJ. Tax rates for the energy portion of the tax are based on annual fuel consumption figures, and so may change in line with the overall fuel mix from one year to the next. The carbon part of the tax has remained unchanged at f. 5.15 (US$ 3) per tonne of CO_2. In order to avoid weakening the international competitiveness of the country's industry, the burden on energy-intensive industry is alleviated though special rates on the energy part of the tax, as well as exemptions for specific energy commodities (not traded residual fuels) used in that sector. Revenue from the tax has been treated as general treasury income since 1992. There is a tax exemption for new renewable energy sources.

35. At the time of the team's visit, preparations were under way for the introduction of a **regulatory tax on energy/carbon** for small users of natural gas, electricity, light fuel oil, heating oil and liquefied petroleum gas (LPG). Other carbon-based fuels and nuclear power are taxed via the environmental tax outlined above. The small-user tax rates are based on the proposed EU directive for a combined CO_2 and energy tax. Except for electricity, the tax is being introduced gradually over a three-year period from 1 January 1996, the aim being to stimulate energy conservation among small energy users. Renewables and heat from district heating systems are exempt from this tax, in order to stimulate their uptake. The cost of electricity and gas is expected to rise by an average of 10-15 and 20 per cent respectively, when tax levels reach their maximum in 1998. Revenue from the tax will be recycled via reductions in income tax, corporate tax and social premiums paid by employers. The tax is expected to result in an annual reduction of 1.7-2.7 million tonnes of CO_2 by 2000, compared to baseline projections.

36. The energy transformation sector accounted for almost a third of CO_2 emissions produced in 1990. The national communication contains a broad outline of the policies and measures contained in the Netherlands energy distribution companies' second environmental plan, MAP II, which was agreed with the Government for the period 1994-1996. MAP II sets forth a package of policies and measures designed to reduce projected growth in CO_2 emissions by 17 million tonnes over the period 1991-2000, and if successful, that would result in a 3 per cent reduction in emissions from that sector over the decade. Of the total reductions, 10.8 million tonnes would come from supply-side measures and 6.2 million tonnes from demand-side measures. MAP II was agreed with the Government for an initial period of three years (1994-1996), with the Government providing f. 150 million per year out of the f. 520 million budget. Around f. 310 million will come from a "MAP levy", averaging 1.8 per cent on consumers' electricity and gas tariffs, and approximately f. 60 million from the funds of the energy distribution companies (EnergieNed). The energy companies have not signalled reductions in their contributions after budget cuts on the Government's side.

37. The bulk of emissions savings is expected to come from increased penetration of CHP and improved utilization of waste heat. The communication quotes a target of 8,000 MW of installed CHP capacity by 2000. Favourable economic conditions, including

subsidies and an obligation for electricity distribution companies to buy surplus production at a certain price ("avoided cost"), have led to a rapid growth in CHP installation. Scrapping of the subsidy, together with the current overcapacity in electricity which has led to a reduction in the guaranteed price, have blunted this incentive. It is still expected that the CHP target will be met on schedule however, since around 7,500 MW were included in "hard plans" within the industry at the time of the review.

38. MAP II also sets subsector targets for 2000 on the demand and supply sides. Results for the period 1991-1994 indicate that a total of 5.5 million tonnes of CO_2 emissions have been avoided. CHP and the heat distribution sector account for an estimated 3.2 million tonnes, households 1 million tonnes and increased utilization of landfill gas 0.76 million tonnes. The team noted that some actions such as installation of CHP within industry could also be reported under the industry long-term agreement and therefore result in double accounting of reductions. In the analysis covering all sectors at the national level, corrections have been made in response to this situation. The team also noted that some target subsectors such as renewables, new technologies and greater energy conservation within industry and non-residential buildings have only yielded limited emission savings to date.

39. Although MAP II is designed to run until 2000, the current agreement between EnergieNed and the Government only runs until the end of 1996. The follow-up MAP III is currently in preparation. The team noted that the increased competition resulting from a liberalized electricity sector will change the conditions under which the previous MAPs were developed, and this could affect the extent to which the energy distribution companies are willing to follow a similar approach, including the funding of measures in MAP III.

40. Limited natural resources are one of the reasons that renewables account for less than 1 per cent of energy supply in the Netherlands. The Government's CO_2 letter indicated that increased quantities of biomass would be used to generate electricity by co-firing two coal power stations with 10 per cent biomass (waste and/or residue wood from thinned forest). The team noted that any expansion of the current demonstration co-firing of one plant with a small percentage of wood would require extensive discussions between the operators and the Government; and use of waste wood as a fuel would have to be consistent with the waste policies of municipalities and provinces.

41. Policies and measures in the **industrial sector**, which accounted for 20 per cent of CO_2 emissions, are characterized by long-term agreements (LTAs) aimed at achieving energy-efficiency improvements. The procedure for drawing up LTAs was described in the communication; to date 28 such agreements have been signed with industrial groups that cover 90 per cent of energy use in industry. The overall aim is to improve energy efficiency by 20 per cent on average between 1989 and 2000, with some sectors having a 10 per cent interim target. The actual level varies for each industry, depending on the scope for cost-effective energy-efficiency improvements. The team noted that while the law in the Netherlands provides for command and control measures to be introduced if industry fails to meet its targets, this option has not been used to date. Provisional results for 1989-1994

covering approximately 73 per cent of industrial energy use (18 LTAs), indicate a 9 per cent energy efficiency improvement. Verification is carried out by the government agency for energy and environment, which aggregates the company-specific data submitted to it. The team noted that this is a demanding task involving innovative methodology.

42. While some of the improvement in energy efficiency is due to better process efficiency, most is due to the increased uptake of CHP and heat distribution which may have taken place even in the absence of LTAs. This means that incremental efficiency improvements achieved because of the LTAs are only part of the total efficiency gains, with autonomous efficiency improvements making up the remainder. The team acknowledged that these agreements concentrate the focus on options to use energy more efficiently and seem to facilitate implementation of cost-effective measures.

43. In the transport sector, which accounted for 16 per cent of CO_2 emissions in 1990, measures have been introduced to limit the growth of road transport, although not necessarily with the primary aim of reducing CO_2 emissions; both passenger and freight transport were projected to grow significantly between 1990 and 2000 in the absence of any such measures. The team acknowledged the strong interaction between these policies and measures, which can be divided into five categories: increasing the proportion of energy-efficient cars, limiting growth in transport, influencing the split between different transport modes, paying attention to spatial planning and parking, and other measures such as car pooling.

44. Because of the already high utilization of public transport, the room for additional CO_2 reductions resulting from programmes aimed at influencing the modal split, notably Rail 21 which will improve rail connections, is limited. The team noted the action taken by the Government to maintain a favourable public/private transport price ratio and recognized that any reduction in the current level of government subsidies to the public transport sector may have adverse impacts on the sector's CO_2 emissions.

45. The team noted that the communication mentioned only some of the transport-related policies in place, omitting, for example, the wide network of cycle lanes and paying limited attention to subsidies for public transport. However, some of the policies and measures outlined, such as the fee on driving during the rush hour, will not be introduced in 1996/97 as indicated, although a toll pricing scheme may be set up at a later date. Other policies and measures adopted subsequent to the communication include one aimed at developing long-term agreements with the freight transport sector. Incentives to purchase fuel-efficient cars are planned from 1997.

46. The **residential sector** accounted for 11.7 per cent of 1990 CO_2 emissions, and the **commercial/institutional sector** a further 5.8 per cent. In order to achieve the 23 per cent energy-efficiency improvement target in households, regulations (efficiency norms) and incentive schemes (via MAP II) are used as well as LTAs in the subsidized housing sector. The communication outlined a number of support mechanisms for the measures in place, but did not lay out the numerous individual measures in detail. The team was given some

background information evaluating the take-up and associated carbon emission reductions associated with MAP II and LTA measures. MAP II for example offers incentives for the installation of insulation and high-efficiency boilers in the home. Although the 1 million tonnes of CO_2 avoided in households due to measures outlined in MAP II represents 31 per cent of total potential savings from 1991 to 2000, achieving the target of 3.2 million tonnes of CO_2 by 2000 is seen to be difficult and costly. Increased insulation, high-efficiency boilers and energy-efficient products each account for approximately a quarter of the total avoided emissions to date. The largest single potential for CO_2 emission reduction lies in insulation, but only 23 per cent of the 1.2 million tonnes CO_2 potential had been achieved by 1994.

47. An even lower proportion of potentially avoidable emissions has been achieved in the **commercial/institutional sector**: 21 per cent of the target for 2000 during the period 1991-1994. The uptake of energy-efficient lighting has not come up to expectations, despite being promoted by both subsidies and regulations. Furthermore, it was noted that 5 LTA's have been concluded in this sector, Schiphol Airport, Royal Dutch Airlines, Health Care, Secondary Vocational Education, and Higher Vocational Education.

48. The target for efficiency improvement in **agriculture**, which accounted for 5.2 per cent of CO_2 emissions in 1990, is 26 per cent between 1989 and 2000. LTAs are the main instrument being used to achieve this aim. Interim progress on LTAs in agriculture was not reported to the team. The target for the domestic **forestry** plan remains unchanged from that described in the communication, although afforestation has started more slowly than originally planned. The contributions from this sector will be limited.

49. Regarding **methane emissions**, the team noted that remarkable reductions are expected through policies drastically changing present practices. NEPP 2 aims to prevent waste and promote recycling. The national communication states that a decree on waste disposal and a ban on landfilling of combustible waste were to come into force for some wastes in 1995, and later for others, which is expected to lead to an increase in energy recovery through incineration. The decree on waste disposal was under consideration by the parliament at the time of the review, while the ban on landfill is coming into force in 1996. An additional policy instrument governing **landfills** is the Soil Protection Act, which requires new landfills to have gas recovery systems. Increased recovery and utilization of landfill gas will be promoted. In 1991 gas recovery from landfills amounted to 37 million m^3, slightly less than the expected proportion of 25 per cent of potential. Estimates for 1994 indicate that 151 million m^3 were recovered and/or burned and the goal for 1995 is 185 million m^3.

50. In order to reduce the current manure surplus in the Netherlands a regulation controlling the amount of phosphates applied to agricultural lands was implemented in 1994. It is anticipated that this measure will indirectly reduce methane emissions through a decrease in animal numbers and hence in enteric fermentation, as well as through improved manure handling. The second policy instrument likely to affect emissions by limiting the number of livestock and hence both enteric and manure-related emissions is the EU common agricultural policy. This policy will result in lower price guarantees for wheat and feeds, higher quality

feeds and consequently a decrease in the generation of methane per animal, as well as reducing the number of animals. The net result is anticipated to be a reduction in emissions of 10 per cent.

51. The national communication states that measures implemented in line with national energy policy will reduce methane losses from older **natural gas distribution** lines. The communication states that these measures will reduce CH_4 emissions by 20 per cent. It does not describe any measures to reduce emissions from **offshore oil and gas** platforms, although possibilities are envisaged in the documentation and were discussed during the review. Offshore fields produce only 25 per cent of the natural gas in the Netherlands, yet are responsible for 80 per cent of methane emissions from the natural gas production sector. As a result of an agreement between the association of oil and gas producers and the Ministry of Economic Affairs, new measures to increase the use of gas otherwise vented are expected to reduce emissions by 31,000 tonnes (40 per cent) in 2000.

52. No specific policies have been formulated for controlling **nitrous oxide** emissions. However, an action plan on N_2O is in preparation. Emissions are estimated to remain stable at the 1990 level in the year 2000 with reductions from manure offset by increased penetration of vehicles fitted with catalytic converters in the automobile fleet. No specific measures, other than those of energy conservation, have been taken to reduced emissions from industry. Annual production of nitric acid is expected to increase by 15 per cent by the year 2000 and, notwithstanding any changes in technology, emissions are similarly expected to increase. The Memorandum on Third Phase Manure and Ammonia Policy (1993) is likely to have a two-fold impact on nitrous oxide emissions: first, by reducing soil emissions, although no estimates have been made because of the high degree of uncertainty, and secondly, by reducing the amount of manure production and hence related N_2O emissions from agriculture by 20 per cent by 2015. Measures to reduce emissions of NMVOCs, CO and NO_x from transport are expected to increase emissions of nitrous oxide.

53. No specific policies are directed towards **PFCs, HFCs and SF_6**, although the team noted that systems using HFCs as replacement for chlorofluorocarbons (CFCs) have the same strict standards to limit leakages as was applied for the CFCs.

54. The effects of a number of **policies and measures** have been quantified in the national communication and in the background material, although their costs are generally not stated. Projected effects and cost indications of policies and measures in the energy distribution sector were available in supporting documentation made available to the team. The Government and EnergieNed have evaluated the interim effects of LTAs in industry and the energy distribution sector's environmental action plan (MAP II). The results indicate significant energy efficiency improvements for the LTAs and avoided CO_2 emissions for MAP II. Some measures have clearly been more successful to date than others, most notably increased CHP and waste-heat utilization in industry; demand-side measures have progressed at a much slower rate. For methane emissions, the main effects are expected to come in the second half of the decade.

IV. PROJECTIONS AND EFFECTS OF POLICIES AND MEASURES

55. In the national communication, the Netherlands provided projections of both energy and non-energy related emissions of CO_2, CH_4 and N_2O, as well as the ozone precursor gases (NOx, NMVOCs and CO) at ten-year intervals for the period 1990-2010. Revised estimates of CO_2 have been made and were presented to the team. The team found that the Netherlands has a strong tradition of using projections as a tool to develop policies and measures. Consequently, the approaches to the projections are well advanced and tested, and include several stages involving different actors. Research institutes developed the model framework and sometimes carry out a first version of the projections, which, particularly for CO_2, can then be developed further by the Government to ensure consistency with economic scenarios and, for example, expected yields of policies and measures implemented or under implementation.

56. The projections in the communication and those used when updating policies in 1995, are developed from multiple economic scenarios. The team concluded that the methodological basis for the projections appeared sound, and that both econometric tools and knowledge of possible technological development are utilized. The assumptions underlying the projections in the national communication were reasonable, but actual developments in important factors such as energy prices (lower than assumed) and economic growth (higher) have been different. The higher economic growth is seen as temporary, while oil and gas prices are now assumed to remain stable at a lower level. In addition, some aluminium plants are now expected to operate a few years into the next century, as a result of supply agreements recently concluded with electricity producers.

57. The new assessment of CO_2 projections by three research institutes in the Netherlands in 1995 presented two scenarios inside the old policy approach, showing 4.6 and 7.5 per cent growth in CO_2 emissions by 2000 compared to temperature-adjusted 1990 figures, in the absence of further measures. Real 1990 values would add an additional 3.8 per cent growth. The projections were further elaborated by the Government to form the basis of the "repair" letter sent to parliament in September 1995. An important difference between the assessment of the institutes and that of the Government was that the Government, after consulting with the other parties to the voluntary agreements, assumed that these will yield the energy efficiency improvements that are targeted. Consequently, the assumptions on energy efficiency improvement this decade were changed from 1.2 per cent annually to 1.7 for the sectors covered and 1.6 per cent overall. Overall, 1.1 per cent was actually achieved between 1990 and 1994. When also implementing the IPCC way of counting feedstocks and base year, the projections showed emissions 2 and 10 million tonnes of CO_2 higher than the target of minus 3 per cent in the two scenarios, equivalent to minus 2 to plus 3 per cent growth (temperature-adjusted). The "repair" letter then introduced new measures estimated to yield 2.1 million tonnes of CO_2 reductions in 2000, and on 1 January 1996 a regulatory CO_2 tax that is expected to yield an additional reduction of 1.7-2.7 million tonnes was introduced. This effect is already accounted for in the projections. Sequestration is assumed to contribute

0.3 million tonnes inside a net approach.

58. Developments in the **industrial, energy and transformation sectors** are crucial to the national emissions total. The team noted the strong assumptions on sharp energy efficiency improvement in industry (1.7 per cent annually), which reflects the targets of the voluntary agreements in this sector. Provisional results for 1989-1994 (covering approximately 70 per cent of industrial energy use) indicate a 9 per cent energy efficiency improvement. More than 50 per cent of this can be attributed to the introduction of CHP. The team noted that the economic incentives for implementing CHP have changed with the abolition of the direct subsidy and reduction of the price incentives, reflecting an excess supply situation for electricity. The extension of CHP in industry could result from remaining market incentives, therefore the magnitude of this extension constitutes a considerable uncertainty that could go both ways. CHP is assumed to grow from 3,100 MW installed in 1993 to 8,000 MW in 2000. The team noted that this implies a strong acceleration of implementation of this technology, but was assured that 7,500 MW was already included in "hard plans" in the energy sector. Added to the current overcapacity in electricity, a major power station will come into operation in 1996.

59. A major uncertainty in the medium and long term will be the development of the gas and electricity markets both domestically and in the European context. The team noted that the proposed energy market reforms could have both positive and negative effects on emissions, and it is not clear what the overall outcome will be. Similar steps in other countries have led to major shifts in prices in the short term, but also to higher supply-side efficiency and changes in investment patterns regarding fuel choices and production technology. Further, the incentives for undertaking demand-side management by utilities could be reduced. The team noted that the reform will create a different setting for policy making. The Netherlands' starting point, with a dominant place of natural gas and limited use of coal, indicates that major reductions in emissions from changes of primary energy source are less likely than in other countries. Reforms entailing changes in the electricity trade and this sector's organization are expected to be gradually implemented over a decade or more.

60. The Netherlands has been importing electricity for a number of years, and net imports may increase by 2000, although a more integrated European electricity market could lead to power plants being built partly for export. There could also be higher yearly fluctuations in emissions, particularly when a fossil fuel-based system such as that of the Netherlands is linked to systems more dependent on renewables, e.g. hydropower.

61. Renewables are projected to increase from 1 to 3 per cent of energy supply by the end of the decade. The team noted that the present level has been reached after decades of effort. The projection represents a rapid development, including an increase in wind power capacity from 153 MW in 1994 to 750 MW in 2000, which implies that siting problems will have to be overcome. Wind generators are now encouraged through energy tax exemption, as direct subsidies have been abolished, but investment support from the industry may still be given through the MAP. The team recognizes that effective implementation of the waste

policy in the national communication is expected to reduce CO_2 emissions by 1,900 Gg by 2000, in addition to reducing methane emissions from waste.

62. The Netherlands was the only country that did not project an increase in **transport emissions** in its communication. In the revised projections, these emissions are stable at the 1994 level, which had grown 15 per cent from 1990, and an additional 11 per cent since 1986, which is the base year for the country's stabilization target for that sector. The communication states that it does not expect the 2000 CO_2 target for freight transport to be met. Recent projections indicate that passenger road transport emissions could decline slightly after 2000.

63. The communication itself indicates that in the longer term, total emissions could grow considerably in the absence of stronger measures. In particular this could happen in the energy, industry and transport sectors, while emissions from the residential sector are projected to decline. Although the 2010 scenarios presented are not compatible with the revised 2000 scenarios (higher growth in GDP and energy prices), the outcome is seen as plausible, as the effectiveness of some existing policies will decrease. One of the developments that may lead to higher emissions is the likely replacement around 2004 of the only significant nuclear plant, Borsele (650 MW), with fossil fuel-based electricity.

64. In the communication, **methane** emissions are projected to decrease from the 1990 level of 1,067 to 786 (kilotonnes) kt (a 26 per cent reduction) in the year 2000 and to 570 kt in 2010, going beyond the national target of a 10 per cent reduction. Emission estimates for the period 1990-1994 show no significant decline in total national emission levels, which was also the case for the landfills. Emissions from these, which account for 35 per cent of the total, are projected to decrease from 382 kt in 1990 to 228 kt in 2000 as the new policy becomes effective from the middle of the decade. Since the policies on landfills imply drastic changes in behaviour within a short time-frame, the team recognized that there were some uncertainties in this subsector regarding the speed and effectiveness of implementation. Agricultural emissions which accounted for 48 per cent of the total 1990 emissions, are projected to decrease from 508 to 402 kt. In the petroleum production sector, where fugitive emissions account for 15 per cent of the total emissions, additional measures being introduced as part of a voluntary agreement with the industry are estimated to reduce those emissions by 31,000 tons, in addition to what is reflected in the above projections.

65. In the communication, **nitrous oxide** emissions are projected to increase from 59.6 in 1990 to 62.2 kt in the year 2000 despite the current stabilization target. Agricultural emissions are projected to decrease from 22.1 kt in 1990 to 17.7 kt in 2000, the result of a decrease in the production and application of animal manure and synthetic fertilizers. Emissions from polluted inland waters are also projected to decline from 10.9 kt in 1990 to 6.9 kt in 2000, partly as a result of a decrease in nitrogen leaching from soils. Offsetting these projected gains is a projected increase of 5.5 kt in emissions from vehicles fitted with catalytic converters from 5.4 kt in 1990 to 11.0 kt in 2000. Although inventories have recently been revised, this does not affect the trends in emissions.

66. No specific projections of **PFC** emissions were made in the communication, but they are expected to remain at 1990 levels in the absence of any process changes. After the team's visit, fluorocarbons were assessed and emissions are now projected to grow from 8, 500 Gg CO_2 equivalents in 1990 to 8,900 Gg in 2000. Nor were there projections for **HFCs or SF_6**, but background material given to the team indicated that use of HFCs could equal a few per cent of GHG emissions in 2000 to 2010. The precursors **NO_x, NMVOCs and CO** are expected to decline as a result of efforts taken to comply with the United Nations Economic Commission for Europe Convention on Long-Range Transboundary Air Pollution.

67. The Netherlands did not provide **a specific estimate of the aggregated effects of measures**, partly because a baseline scenario was not available and was seen as being subject to problems of both principle and methodology. The team recognized that estimating the effects only of those measures introduced after 1990, which was required in the guidelines, would not have done justice to the Netherlands' efforts to mitigate climate change, which started in the 1980s. In the national communication, it is also argued that no distinction can be made between policy-induced and autonomous energy conservation. The team recognized the methodological problems involved in such estimates, but noted that a number of disaggregated assessments of the effects of different policies and measures were made both in the communication and when launching additional measures in the "repair" letter. Moreover, it noted the Netherlands' strong tradition of evaluating policies *ex post*, which could form another basis for such estimates, as well as its strengths on the methodological side. In view of the aforementioned past growth in CO_2 emissions, uncertainties related to effects of certain measure, and inherent uncertainties in projection estimates, returning greenhouse gas emissions to their 1990 levels remain an open question. However, it is noted that regular monitoring is a crucial element of Netherlands' policymaking.

V. EXPECTED IMPACTS OF CLIMATE CHANGE

68. The national communication gives a short description of vulnerability and adaptation assessments with due attention to uncertainties. Included are studies of sealevel rise and flooding, wind scenarios, precipitation and evaporation effects, coastal erosion, salt water intrusion in ground water, river discharges, etc. Because of its geographical situation, the Netherlands is vulnerable to changes in sealevel, especially changes associated with strong winds. Recent floods (1993, 1995) have shown that the Netherlands is vulnerable to extreme events affecting the rivers under present management practices.

69. The assessments on impacts were carried out in the framework of a governmental programme by the Coastal Zone Management Centre, other governmental bodies and scientific institutions. Assessments of environmental and socio-economic impacts of temperature increase have also been carried out. The potential effects of climate change in

the Netherlands are expected to be limited by appropriate developments in existing coastal zone, water management and agricultural programmes. Possible effects on agriculture have not been quantified so far, but these are seen as being less important than other changes arising, for example, from the implementation of the EU common agricultural policy.

VI. ADAPTATION MEASURES

70. The national communication gives a short description of practical measures implemented in the field of seashore protection and coastal management, where the level of adaptation to extreme events in the present climate is high. Under the Ministry of Transport, a Coastal Zone Management Centre looks after these aspects and is funded by the Government. The team noted that the present practice provides a flexible way of defending the coastline, and could be looked upon as an autonomous adaptation measure. A policy note on improving construction practices near coastal zones was submitted to parliament in 1995. Fresh water is intensively managed in the Netherlands and scenarios for adapting the hydrological regime to climate change were shown. The review team noted that further studies were seen as required for water management and agriculture.

71. Given its geographical conditions and tradition of coastal and freshwater management, the Netherlands is actively participating in international cooperation in the field of impacts, vulnerability and adaptation and offers its relevant knowledge to the international community. It supports and participates actively in the IPCC and has had a central role in other activities such as the World Coast Conference in 1993, held in the Netherlands, and a certain role in the International Conference on Climate Change and Adaptation Assessments, 1995, held at Saint Petersburg.

VII. INTERNATIONAL COOPERATION, FINANCIAL COMMITMENTS AND TECHNOLOGY TRANSFER

72. The Netherlands contributed US$ 52.8 million to the pilot phase of the Global Environment Facility (GEF), and its contribution to the first replenishment of the GEF amounted to US$ 71.4 million. The ratio of official development assistance (ODA) to GNP has been over 0.7 per cent for a number of years, and was 0.86 per cent in 1992, 0.82 in 1993 and 0.76 in 1994. The Government aims to reach 0.1 per cent of GDP in new and additional funding for environmental cooperation. The team noted that these financial flows have been given political priority in a tight budgetary situation, and that the Government is aiming at fixing the ODA/GNP ratio at 0.8 per cent in the national budget. The ODA projects have been routinely checked for consistency with environmental objectives for a number of years. Technology and knowledge is spread through the involvement of industry and other participants in the projects.

73. The Netherlands also provides significant support to developing countries preparing

national communications. This country study programme covers emission inventories, vulnerability and response (mainly adaptation) assessments with seven countries in Asia, Africa and South and Central America (Bolivia, Costa Rica, Ecuador, Ghana, Senegal, Suriname and Yemen). The review team was provided with details of these programmes, which included a few other studies in support of climate programmes in Bangladesh, Egypt and Viet Nam, where the Netherlands' competence in coastal zone and river delta management was seen as particularly useful. The results of the projects will be presented in 1997. The team also noted that the National Institute for Coastal and Marine Management has developed interactive tools for integrating climate change aspects in coastal zone management that are applicable to developing countries, and the Institute cooperates widely with these countries.

74. The team noted the Netherlands cooperation with countries with economies in transition in the field of energy and environment, including climate change related projects, which is interwoven with cooperation through the Energy Charter and the European Union. The projects involve Netherlands companies and have had an emphasis on feasibility studies and demonstration, but a change towards involvement in carrying out energy sector projects is envisaged.

75. The team noted that, although technology is transferred through the aid flows, the most important transfer is likely to happen through the market. Little information was given in the communication on the transfer of technology, reflecting limited requirements in the reporting guidelines. The team noted that the Netherlands electricity generating board on its own is responsible for an effort to transfer technology to Romania.

76. The Netherlands strongly emphasizes the importance of developing the concept of joint implementation of commitments among countries. It has been active in this field both through theoretical contributions, including a major international seminar at Groningen in 1994, and through practical projects and dissemination of information, including a quarterly bulletin. The team noted that the FACE (Forests Absorbing Carbon dioxide Emissions) foundation, set up by the Netherlands electricity generating board already in 1990 to encourage sequestration of CO_2 in forests both domestically and abroad, could provide relevant experience to the ongoing pilot phase of activities implemented jointly. The Netherlands Government has granted f. 84 million for the period up to 1999 to develop the concept further through practical projects in both Annex I and non-Annex I countries. The development of a system that gives incentives to the private sector to participate is seen as crucial, and the present lack of a clear concept on crediting was seen as affecting the interest from this sector negatively. The team notes that the ongoing restructuring of the electricity sector may affect the operation of joint implementation programmes.

VIII. RESEARCH AND SYSTEMATIC OBSERVATION.

77. The Netherlands undertakes a broad range of systematic research and monitoring related to climate change. This is funded either by the Government, through universities or

by the meteorological office. The efforts are described relatively briefly in the communication and include aspects of the climate system, better understanding of the anthropogenic GHG sources and sinks, estimations of impacts on terrestrial and aquatic ecosystems, regional hydrology, paleoclimatatology and diagnosis of climate system model development, risk assessment and technological and/or social response strategies. They are well documented and disseminated to the international scientific community. The team noted in particular the comprehensive documentation produced by a seminar marking the end of the first phase (1990-1994) of the Netherlands national research programme on global air pollution and climate change. It also noted that the research efforts build on established strength in the atmospheric sciences and oceanography, as well as in the social sciences and economics.

78. During the second phase of the research programme, a shift in priorities from systems to policy-oriented research is envisaged. The team noted the stronger emphasis on integration between researchers in the social sciences and those from the natural science community, for example through activities related to the IMAGE model. Areas of priority are detection of climate change, consequences of such change on food and water supply, and policy-oriented research and development. The team noted that the Netherlands also keeps track of extreme events such as the severe storms and floods of recent years, which could illustrate possible effects associated with climate change.

79. The team noted that future research and development will be carried out in a situation where less money is available from the Government, and that a major challenge is to involve non-governmental sponsors. This is also the case for technological research and development, where public budgets are subjects to major reductions. However, this could be partly offset by a stronger focus on climate change related research and development in the programmes funded by European Union. The team noted the close interaction between the domestic activities and such international research programmes and assessments as IPCC, the International Geosphere-Biosphere Programme, the World Climate Research Programme, the Human Dimensions of Global Environmental Change Programme, the European Union and the Global Climate Observing System, as well as cooperation at a bilateral level.

IX. EDUCATION, TRAINING AND PUBLIC AWARENESS

80. The team noted the tradition of close partnerships between policy makers, local and regional authorities, researchers, non-governmental organizations and citizens in planning and implementing socially important measures and actions in the Netherlands. This approach ensures a high level of awareness of climate change among the various stakeholders responsible for implementing policies in the Netherlands, which are each taking their responsibilities for information activities. The involvement of non-governmental organizations in climate change programmes has also been encouraged through workshops and seminars.

81. Several campaigns to raise awareness of climate change and the possibilities of

reducing emissions, e.g. through energy conservation and transport measures, have been initiated by the Government. The climate change campaign was devised both for adults and for young people using media such as booklets, cinema advertising and even a rap song. Surveys have shown that the general public is aware of policy goals and proposed measures. The team noted the plans to accompany the introduction of a regulatory energy tax in 1996 with another campaign to raise awareness. The team also noted that a seminar to disseminate IPCC findings to industry had been held in March 1996.

82. The Netherlands publishes and distributes internationally a number of regular journals free of charge, such as the bimonthly *Change* research and policy newsletter on global change, and the *Joint Implementation Quarterly*. Some policy planning models and databases, such as ICARUS, are also available free of charge to the international climate change community and interested users, and specific funds are set aside to disseminate research and development information. In addition, a number of international conferences, workshops and other events, aimed at providing a better understanding of climate change and cooperation, have been organized or supported by the Netherlands.

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